Math 2802 N1-N3 Worksheet 11

April 20th, 2018

1. Circle **T** if the statement is always true and circle **F** if it is ever false. The matrices here are $n \times n$.

a) **T** **F** If A is symmetric and has an eigenvalue λ, then there is a unit-length vector x such that $\lambda \leq x^T Ax$.

b) **T** **F** If A is an $n \times n$ matrix with eigenvalues $\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_n$, then the condition number equals λ_1/λ_n.

2. For the quadratic functions below, find the vector u attaining the maximum value of $Q(x) = x^T Ax$ among vector of unit length; i.e. constrained to have $x^T x = 1$.

a) $A = \begin{pmatrix} 3 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 2 & 2 \end{pmatrix}$

b) $A = \begin{pmatrix} 3 & -2 \\ -2 & 3 \end{pmatrix}$

3. Find the singular value decomposition $A = U\Sigma V^T$ of $A = \begin{pmatrix} 7 & 6 \\ 0 & 0 \\ 6 & 2 \end{pmatrix}$